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A new species of *Kisella* Harz, 1973 from the Tuscan-Emilian Apennines National Park in Italy

(Insecta: Orthoptera: Acrididae: Podismini)

Abstract

Kisella frinias n. sp. from Bargetana in Tuscan-Emilian Apennines (Northern Italy) is described. It is distinguished from the congeneric species by the male copulatory stilets shape. It is endemic to Tuscan-Emilian Apennines, where so far it has been found in a single locality in a very small area, despite the numerous researches in the surrounding places. The author presents a short resume of the taxonomic vicissitudes of the genus *Kisella*. Habitat, morphology and variability of the n. sp., and some congeneric species, are illustrated with pictures and drawings. A hypothesis to explain its origin and the current isolation from the other species of the genus is presented.

Key-words: *Kisella frinias* n. sp., *Kisella*, Podismini, Melanoplinae, Acrididae, Orthoptera, taxonomy, morphology, Appennino Tosco-Emiliano National Park, Northern Apennines, Emilia-Romagna, Italy

Riassunto

[*Una nuova specie di* Kisella *Harz, 1973 del Parco Nazionale dell'Appennino Tosco-Emiliano in Italia (Insecta: Orthoptera: Acrididae: Podismini)*]
Viene descritta *Kisella frinias* n. sp. della Bargetana (RE) nell'Appennino Tosco-Emiliano. Essa si distingue dalle congeneri per la forma degli stiletti copulatori maschili ed è endemica dell'Appennino Tosco-Emiliano, dove finora è stata ritrovata in una sola località in un'area molto ridotta, nonostante le numerose ricerche compiute dall'autore in zona. L'autore presenta un breve riassunto delle vicende tassonomiche del genere. Vengono illustrati con fotografie e disegni l'habitat, la morfologia e la variabilità della n. sp. e di alcune congeneri. Viene inoltre presentata un'ipotesi per spiegare la sua origine e il suo isolamento dalle altre specie del genere

Parole chiave: *Kisella frinias* n. sp., *Kisella*, Podismini, Melanoplinae, Acrididae, Orthoptera, tassonomia, morfologia, Parco Nazionale dell'Appennino Tosco-Emiliano, Appennino settentrionale, Emilia-Romagna, Italia.

Introduction

There are many taxonomic studies on the genera related to *Miramella* Dovnar-

Zapolskij 1933; in fact *Capraiuscola* Galvagni, 1986, *Galvagniella* Harz, 1973, *Kisella* Harz, 1973 and *Nadigella* Galvagni, 1986 are sometimes considered subgenera of *Miramella*, sometimes separate genera. Harz (1973) described the subgenera *Kisella*, in which were included *M. irena* (Fruhstorfer, 1921) and *M. carinthiaca* (Puschnig, 1910), and *Galvagniella* with only the species *M. albanica* Mistshenko, 1952, while *M. solitaria* (Ikonnikov, 1911), *M. alpina* (Kollar, 1833) and *M. ebneri* Galvagni 1953 were attributed to the nominotypical subgenus. Later Storozhenko (1983), the first who studied the male copulatory system of *Miramella*, showing the differences between *M. solitaria* and the other European species of the genus, described the subgenus *Harzella* Storozhenko, 1983 to which were assigned the species *alpina* and *ebneri*, formerly belonging to the genus *Miramella*. Later Galvagni (1986b) made an important revision of the genus *Miramella*. Based on male copulatory stilets, he raised to genus the two subgenera described by Harz (1973) and the subgenus *Capraiuscola,* instituted in the same year, and described the genus *Nadigella* for *M. formosanta* (Fruhstorfer, 1921); then Galvagni synonymized the subgenus *Harzella* with *Kisella* and attributed to it *M. irena*, *M. carinthiaca*, *M. alpina* and *M. subalpina* (Fischer, 1850), previously considered by Harz (1975) as a subspecies of *M. alpina*. Nadig (1989) published a detailed and major work on the genus *Miramella* in the Alps, Jura, Vosges and Schwarzwald, treating the genera described by Galvagni as subgenera and *M. subalpina* as a subspecies of *M. alpina*. Nadig also wrote that in the contact area of the range of these species there are hybrids, and in the wide contact area of *M. alpina alpina* and *M. alpina subalpina* there are many intermediate populations. There is currently a lot of confusion on the taxonomy of the *Miramella* genus group. Generally there is a tendency to follow Nadig's model (1989), but in Italy the Galvagni model (1986b) is more common, also accepted in the "Fauna d'Italia" (Massa et al., 2012).

The species of the *Miramella* genera group known to date for Italy were four: *Kisella irena*, *Kisella alpina*, *Kisella subalpina* and *Nadigella formosanta*.

K. irena occurs in the eastern Alps, generally between 1000 and 2000 m, but in Berici Hills it reaches 115 m a.s.l. and in Friuli-Venezia Giulia it reaches sea level. *Kisella alpina* and *subalpina* live at high altitudes, the former in Friuli-Venezia Giulia, Veneto and eastern Lombardia, the latter known in Italy only in the area of Little St Bernard and Courmayeur in Aosta valley. *Kisella alpina* was also reported by Targioni Tozzetti & Stefanelli (1882) from Monte Catria (Central Apennines) sub *Pezotettis alpina* Fisch., but that is almost surely an error, and the record should be attributed to *Podisma magdalenae* Galvagni, 1971 (Galvagni, 1971). *Nadigella formosanta* has two subspecies present between Lombardy and Piedmont, the nominotypical one is eastern and the second, *Nadigella formosanta bessae* (Nadig, 1989), is western, but their geographical boundary is still not very clear. In all the western Alps south of the Aosta valley and in the Apennines the

presence of species of the *Miramella* genera group had not yet been reported, so the population of *Kisella* I have recorded from Bargetana, in Tuscan-Emilian Apennines, is very isolated from the others known so far. Due to the differences from the congeneric species in the features of the copulatory stilets of male genitalia, I propose to assign this population to a new species, described here below.

Materials and methods

In conformity with Fauna d'Italia (Massa et al., 2012) this work is based on the revision by Antonio Galvagni (1986b), standing by a new revision of the *Miramella* genera group. I have examined 16 males and 10 females of the n. sp. that I caught all in the type locality (Bargetana), some of the *Kisella* specimens housed in the Galvagni and Fontana collections in Museo Civico di Rovereto and some specimens of *Kisella irena* from Marco Villani collection (Alfonsine, Ravenna). Measurements were taken with a vernier caliper with a precision of ± 0.1 mm. All the pictures were taken with an Olympus OM-D E-M10 Mark II digital camera with a ED 30mm Macro lens.

Kisella frinias n. sp.

Material examined. Holotypus: ♂, Bargetana, Val d'Ozola, 1750 m, 44°15'N 10°24'E, 29.VII.2020, leg. & det. Ettore Rivalta, in coll. Galvagni & Fontana at Museo Civico di Rovereto.
Paratypi: 15 ♂♂, 10 ♀♀, Bargetana, Val d'Ozola, 1750 m, 44°15'N 10°23'-24'E, 29.VII.2020, leg. & det. Ettore Rivalta, coll. 4 ♂, 3 ♀♀ in coll. Galvagni & Fontana at Museo Civico di Rovereto, 11 ♂♂, 7 ♀♀ in coll. Ettore Rivalta.

Diagnosis. *Kisella frinias* n. sp. clearly belongs to the genus *Kisella* for the shape of the male copulatory stilets. The species is brachypterous and has medium-sized tegmina that in the female never overlap, in the male sometimes barely touch each other. Externally, *Kisella frinias* n. sp. is almost indistinguishable from the other species of this genus: the differences are all in the shape of male copulatory stilets. The new species is distinguishable from *K. irena* and *K. carinthiaca* by the dorsal view of the dorsal valvae of the male copulatory stilets, that in *Kisella frinias* n. sp. are separated beyond the base (Figs 7-9 and 12) (cfr. Galvagni, 1986b), and from *K. alpina* and *K. subalpina* for the lateral view of ventral valvae of male copulatory stilets, that are straight or slightly sinuous, gradually tapering to the tip (Figs 13-18).

Description. Antennae filiform and green, fastigium of vertex pronounced, trapezoidal, with a longitudinal median concavity more or less slight. Occipital

area black, black with two or three greenish stripes or, especially in the females, totally green.
Posterior area of pronotum in both sexes generally not larger than the anterior, pronotum with three traverse pronounced sulci. Metazona smooth, a little longer than prozona, that is rugose. From a lateral view, the male pronotum is sometimes a little concave, but more commonly flat, as in the females. Disk curved and convex.
Tegmina ovoidal, rounded both in the anterior and in the posterior margin, medium-sized, in the male reaching about the middle of abdomen and not overlapping, at the most barely touching each other; in the female they are shorter and never touch each other, in both sexes brown with green costal margin. Hind wings a little shorter than tegmina. Tympanum half-moon shaped, more or less covered by tegmina depending on shape, size and position of them. Supra anal plate green in the female and black in the male, with one or two median greenish slight concavities. Cerci subconical, in the male blackish and flattened, in the female greenish and short. Ventral valvae of male copulatory stilets slender, in lateral view right or slightly sinuous, gradually tapered up to the tip (Figs 13-18), just a little longer than dorsal valvae, that in dorsal view are separated beyond the base (Figs 7-9). Dorsal valvae of ovopositor pointed, with concave dorsal surface. Male subgenital plate tapered and sharp, variably with greenish and blackish parts, but always presenting a blackish tip.
Hind-femora greenish with some black spots mostly in the inner face and reddish ventral margin; black knee, tibiae in the male basally dark blue and apically green or yellow, in the female more light, pale blue or yellow, with blackish or whitish spines with black tip.
General coloration variable with parts of bright green and black, but when the specimens dry up the pattern generally darkens. Longitudinal black band running over all the body from the occipital area, sometimes reaches only the pronotum.

Measurements.

	Holotypus	Paratypi ♂♂	Paratypi ♀♀
Pronotum	4.0 mm	3.5-4.0 mm (min-max) 3.8 mm (average)	4.4-5.3 mm (min-max) 4.9 mm (average)
Right tegmina	6.7 mm	4.4-6.7 mm (min-max) 5.5 mm (average)	5.4-7.2 mm (min-max) 5.9 mm (average)
Right hind-femur	9.5 mm	8.6-10.0 mm (min-max) 9.4 mm (average)	10.5-12.4 mm (min-max) 11.4 mm (average)

Comparative notes. Clear differences between *Kisella frinias* n. sp. and the congeneric species are found in the shape of male copulatory stilets: *K. carinthiaca* has straight and parallel dorsal valvae of male copulatory stilets, as long as half the ventral valvae, and for this it is very different from the n. sp.; also *K. irena* has different dorsal valvae, that are separated from the base (Fig. 12) (Galvagni, 1986a; Massa et al., 2012). In *K. alpina* and *K. subalpina* the valvae of male copulatory stilets in dorsal view are separated beyond the base and indistinguishable from each other and from *K. frinias* n. sp., but the ventral valvae are clearly different in lateral view: in *K. alpina* they are abruptly narrowed toward the middle and generally strongly sinuous (Fig. 18), in *K. subalpina* they are strongly sinuous and folded inwards and gradually tapering to the tip (Fig. 17); in *K. frinias* n. sp. they are straight or slightly sinuous and gradually tapering to the tip (Figs 13-16). The variability of the valvae of male copulatory stilets of *K. irena*, *K. carinthiaca*, *K. alpina* and *K. subalpina* is shown in Galvagni (1986a and 1986b) and Nadig (1989).
The length of tegmina was considered by some authors as a secondary weak difference between the species of *Kisella*, but in my opinion this character is too variable and I have not consider it in this work.

Distribution and origin. *Kisella frinias* n. sp. is present only in a small area of Tuscan-Emilian Apennines: the species is not present in the apparently very similar nearby mountains and grasslands. In my excursions during the last years I have visited many times various mountains of Tuscan-Emilian Apennines like Corno alle Scale, Monte Cimone, Monte Rondinaio, Monte Giovo, Monte Cusna and Alpe di Succiso, never finding *Kisella frinias.* The locality of Bargetana is in the Ozola valley that is between two of the highest mountains of the northern Apennines: Monte Prado (2054 m) and Monte Cusna (2121 m); for this reason it is a very cool place for the area, also rich in vegetation and little streams. Only in that small area the species could survive during the current interglacial stage. The species is likely a glacial relict: in one of the last glacial periods the genus *Kisella* was probably present in all the pre-Alpine valleys and the northern Apennines, but during the interglacial warming it could survive only in suitable habitats and became extinct in most of the Apennines and Western Alps as far as Valle d'Aosta or maybe farther. This distribution areal is very strange, and could be explained by two hypothesis. The first one is that the current areal of genera *Kisella* and *Nadigella* in Italy matches the annual rainfall map: maybe the rainfall is somehow linked to the well-being of these orthopterans; in fact, the western Alps of Piedmont are poor of rainfall compared to Tuscan-Emilian Apennines and central and eastern Alps. Another possibility of interpretation of this strange distribution could be that the genus is Transpadane: maybe in the last interglacial period the genus lived throughout the Po valley extending to Veneto and Emilia-Romagna,

Fig. 1: *K. frinias* ♂ and ♀ on *Rubus idaeus* (Bargetana, Val d'Ozola, RE, 1750 m, 29.VII.2020).

Fig. 2: *K. frinias* ♂ on *Vaccinium uliginosum* (Bargetana, Val d'Ozola, RE, 1750 m, 29.VII.2020).

Fig. 3: *K. frinias* ♀ on *Rubus idaeus* (Bargetana, Val d'Ozola, RE, 1750 m, 29.VII.2020).

Fig. 4: *K. frinias* ♀ (Bargetana, Val d'Ozola, RE, 1750 m, 29.VII.2020).

but with the climate warming it was forced to go back to the mountains. In fact the genus is present with *K. irena* in Friuli-Venezia Giulia also at sea level (Massa et al., 2012) and on Berici Hills, separated from the Alps by a narrow stretch of plain. Likely in the last glacial period it also lived in this area on the plain: a recent colonization does not seem possible (Buzzetti & Fontana, 2006).

Ecology. *Kisella frinias* n. sp. occurs only in a very small area in the Tuscan-Emilian Apennines National Park, in the northern side of Monte Prado (2054 m) that is the 3rd higher mountain of northern Apennines. I have seen the species living in a dense population, together with the other orthopterans *Polysarcus denticauda, Metrioptera caprai galvagnii*, *Pholidoptera aptera goidanichi*, *Podisma dechambrei*, *Pseudochorthippus parallelus* and *Euthystira brachyptera* which are much more widespread than *Kisella frinias* in the grasslands of Monte Prado and the nearby Monte Cusna. The type locality, the only one where the species lives, in fact is very peculiar because it is cool and rich in vegetation and little streams. The species lives principally on *Vaccinium myrtillus*, *Vaccinium uliginosum* and *Rubus idaeus*, which are good hiding places for *Kisella frinias* when it is disturbed; I found it only in the area near the treeline and small beech woods. The species extends no higher than 1750 m a.s.l., near the treeline of the Ozola valley. Luckily this area belongs to the "Appennino Tosco-Emiliano" National Park, and it is substantially protected from human activity. However due to the very small areal of distribution, the peculiar ecological requirements of the species and the particular type of habitat threatened by the current temperature rise, the species is vulnerable and must be further protected.

Derivatio nominis. The specific epithet of *Kisella frinias* derives from the Latin word *Friniates* attested only in the plural by the Roman historian Titus Livius in his *Ab urbe condita* (XXXIX, II). The *Friniates* were an ancient Ligurian people of the Roman times dwelling in the area of the Emilian Apennines, where the new species occurs. Following the model of the word *Arpīnās,* (inhabitants of *Arpīnum*; masculine plural: *Arpinates*; feminine singular: *Arpīnās*) the correct term in the feminine singular of *Friniates* should be *Frinĭās*.

Key to genus *Kisella*

1 Dorsal valves of male copulatory stilets, in dorsal view, separated from the base (Fig. 12)…… **2**

– Dorsal valves of male copulatory stilets, in dorsal view, separated beyond the base (Figs. 7-11)……..... **3**

2 Dorsal valves of male copulatory stilets straight and parallel, long as an half of ventral valves …..……...…..... ***Kisella carinthiaca*** (Puschnig, 1910)

– Dorsal valves of male copulatory stilets, in dorsal view, long more than an half of ventral valves (Fig. 12); ventral valves, in lateral view, straight or slightly sinuous, gradually tapered up to the tip…….. ……..…….... …. ***Kisella irena*** (Fruhstorfer, 1921)

3 Ventral valves of male copulatory stilets, in lateral view, abruptly restricted toward their half (Fig. 18) ……..... ***Kisella alpina*** (Kollar, 1833)

– Ventral valves of male copulatory stilets, in lateral view, tapered gradually up to the tip (Figs. 13-17)…….....…….… **4**

4 Upper margin of ventral valves of male copulatory stilets, in lateral view, strongly sinuous and folded inwards (Fig. 17)…… ……..... ***Kisella subalpina*** (Fischer, 1850)

– Upper margin of ventral valves of male copulatory stilets, in lateral view, straight or slightly sinuous (Figs. 13-16)…….....…. ***Kisella frinias*** **n. sp.**

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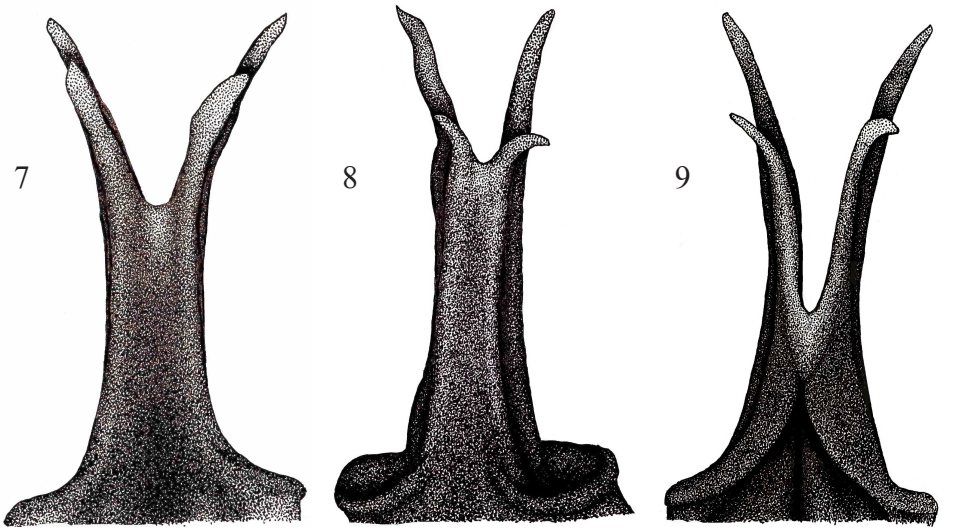
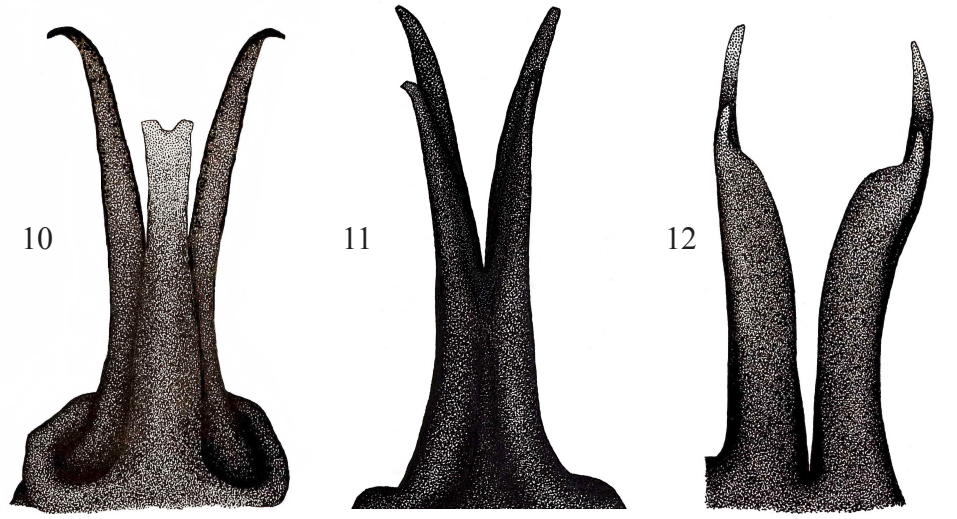
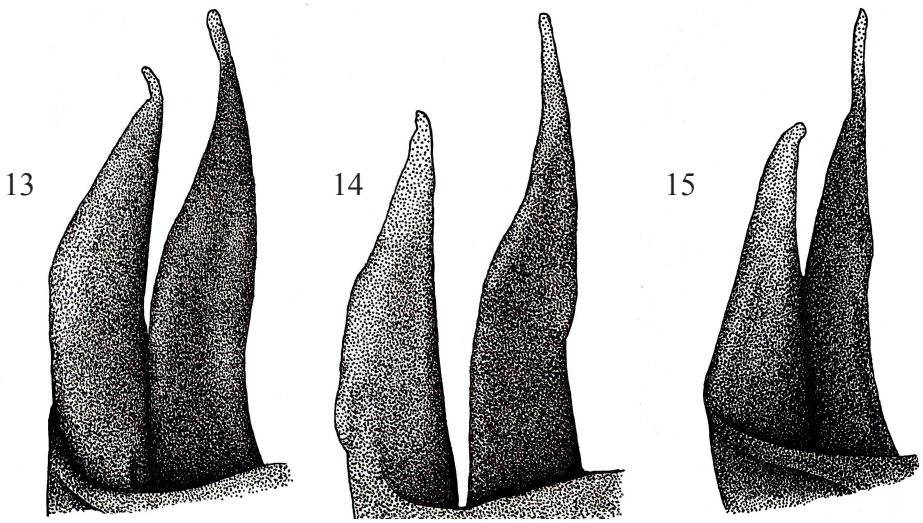
Figg. 5-6: *K. frinias* habitat (Bargetana, Val d'Ozola, RE, 1750 m).

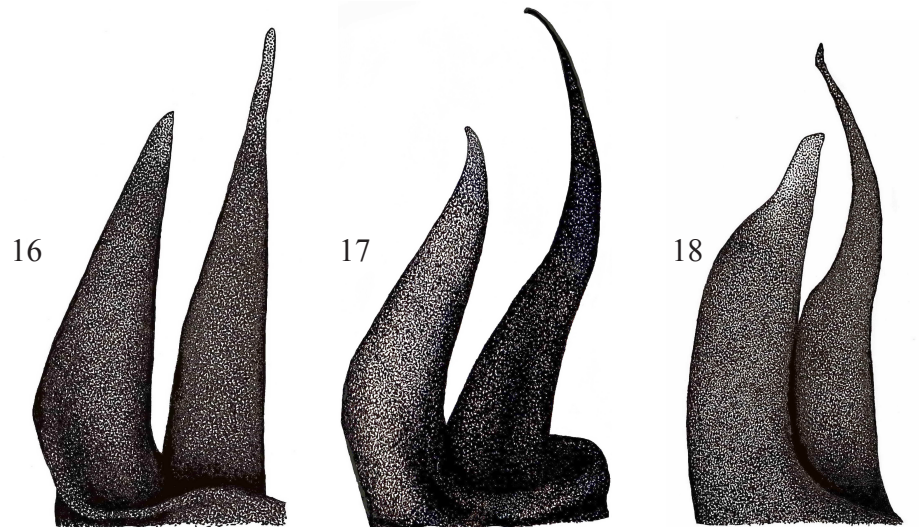


Figg. 7-9: *K. frinias* male copulatory stilets in dorsal view (Bargetana, Val d'Ozola, RE, 1750 m, 29.VII.2020).



Figg. 10: *K. subalpina* male copulatory stilets in dorsal view (Col de la Faucille, Ain, France, 1899).
Fig. 11: *K. alpina* male copulatory stilets in dorsal view (Chlum u Třeboně, Bohemia)
Fig. 12: *K. irena* male copulatory stilets in dorsal view (Passo Coe, TN, 1600 m, 25.VI.2020)





Figg. 13-16: *K. frinias* male copulatory stilets in lateral view (Bargetana, Val d'Ozola, RE, 1750 m, 29.VII.2020).

Fig. 17: *K. subalpina* male copulatory stilets in lateral view (Col de la Faucille, Ain, France, 1899).

Fig. 18: *K. alpina* male copulatory stilets in lateral view (Chlum u Třeboně, Bohemia).

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